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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/384,971	08/30/1999	MASAHIKO KUBOTA	35.C13752	8550

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EXAMINER

BROOKE, MICHAEL S

ART UNIT PAPER NUMBER

2853

DATE MAILED: 11/15/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/384,971

Applicant(s)

KUBOTA ET AL.

Examiner

Michael S. Brooke

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--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 September 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,9-15 and 19-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5,9-15 and 19-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 August 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 15. 6) ☐ Other:

DETAILED ACTION

Continued Prosecution Application

1. The request filed on 10/30/02 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 09/384,971 is acceptable and a CPA has been established. An action on the CPA follows.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 9, 21/1 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Tachihara (5,481,287).

Tachihara teaches an ink jet print head comprising a heat generating element (502) that is connected to a pair of electrodes (503) and which discharges ink from a discharge port. A protective coating (504) is provided over the heat generating element. As can be seen in Fig. 8(B), the protective coating has a first region, with a substantially uniform thickness along a direction connecting the pair of electrodes and a second region, with a substantially uniform thickness along a direction connecting the pair of electrodes, that is stepwise thinner than the first region. By varying the energy applied to the heat generating element, a bubble may be generated on one or more of the

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different protective coating portions, thereby allowing the volume of the droplet to be varied (col. 6:37-61). While Fig. 8(B) does not illustrate the location of the nozzle, The discussion of Fig. 9 (col. 6:62-67 and col. 7:1-7) indicates that the heating portion (903), which has the highest current density, that is, the portion where the bubble forms first, is located closest to the nozzle. Applying this teaching to Fig. 8(B), results in the thinnest portion of the protective coating being nearest to the nozzles, since the bubble first forms at the thinnest portion. Tachihara further teaches that the heat generating element is made of HfB_2 , which inherently has a positive temperature coefficient. While not specifically illustrated, the printer of Tachihara would inherently possess a member for mounting the print head.

The steps of the method of claim 22 are deemed to be inherent in view of the functions of the apparatus described above, in that when the apparatus of Tachihara performs its intended functions, it would necessarily perform the claimed method steps.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tachihara (5,481,287), as applied to claims 1, 2, 9, 21/1 and 22 above, and further in view of Matsumoto (4,429,321).

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Tachihara teaches the claimed invention with the exception of a driving circuit having a plurality of function devices for driving the heat generating elements provided with the substrate.

Matsumoto teaches an ink jet head comprising an epitaxial layer (119) which is a substrate. The substrate contains a plurality of function elements (11) which drive the heat generating elements (105). Integrating the function elements into the substrate provides the advantage of improving printing speed and recording element density col. 1:26-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided Tachihara with function elements in the substrate which drive the heat generating elements for the purpose of improving printing speed and density, as taught by Matsumoto.

6. Claims 11, 12, 21/11 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tachihara (5,481,287) in view of Nakata et al. (EP-764,531).

Tachihara teaches the claimed invention, as discussed above, with the exception of a moving member.

Nakata et al. teaches an ink jet print head comprising a moving member (31) for the purpose of directing the propagation of the pressure wave toward the ejection outlet, thereby increasing ejection efficiency, ejection force and ejection speed (see Summary).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided Tachihara with a moving member for the purpose of directing the propagation of the pressure wave toward the ejection outlet, thereby

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increasing ejection efficiency , ejection force and ejection speed, as taught by Nakata et al.

The steps of the method of claim 23 are deemed to be obvious in view of the functions of the apparatus described above, in that when the apparatus of the combination performs its intended functions, it would necessarily perform the claimed method steps.

7. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tachihara (5,481,287) in view of Nakata et al. (EP-764,531), as applied to claims 11, 12, 21/11 and 23 above, and further in view of Murthy et al. (5,658,471).

Tachihara, as modified, teaches the claimed invention with the exception of the heat generating element being composed of polycrystalline silicon.

Murthy et al. teaches that HfB_2 and polysilicon (polycrystalline silicon) are art recognized equivalents for making a heat generating element (col. 7:1-3). Because these two materials were art recognized equivalents at the time the invention was made for making a heat generating element for an ink jet printer, one of ordinary skill in the art would have found it obvious to substitute a polycrystalline silicon heat generating element for the HfB_2 heat generating element taught in Tachihara, for the purpose of ejecting a droplet of ink.

8. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tachihara (5,481,287) in view of Nakata et al. (EP-764,531), as applied to claims 11, 12, 21/11 and 23 above, and further in view of Matsumoto (4,429,321).

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Tachihara, as modified, teaches the claimed invention with the exception of a driving circuit having a plurality of function devices for driving the heat generating elements provided with the substrate.

Matsumoto teaches an ink jet head comprising an epitaxial layer (119) which is a substrate. The substrate contains a plurality of function elements (911) which drive the heat generating elements (105). Integrating the function devices into the substrate provides the advantage of improving printing speed and recording element density (col. 1:26-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided Tachihara with function elements in the substrate for driving the heat generating elements for the purpose of improving printing speed and density, as taught by Matsumoto.

9. Claims 1-5, 9 and 21/1 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozaki et al. (5,660,739) in view of Shirato et al. (4,458,256).

Ozaki et al. teaches an ink jet print head comprising a heat generating element (107) that is connected to a pair of electrodes (103, 104) and which discharges ink from a discharge port (1111). As discussed at col. 5:32, a first protective coating (108a), made of PSG, is provided over the heat generating element. The PSG coating is etched with a solution of buffered fluororic acid (hydrofluoric acid). After the PSG layer has been etched away, a second protection layer, made of SiN, is deposited over the PSG layer and the etched portion. As can be seen in Fig. 2, this results in a structure, wherein the protective coating has a first region that is formed from two layers and has a

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substantially uniform thickness along a direction connecting the pair of electrodes and a second region that is formed of a single layer, has a substantially uniform thickness along a direction connecting the pair of electrodes and is stepwise thinner than the first region. Looking at Figs. 2 and 7, it can be seen that the second region is closer to the nozzle than the first region. Ozaki et al. further teaches that the heat generating element is made of TaN, which inherently has a positive temperature coefficient. Fig. 8 illustrates a member (HC) for mounting the print head.

Ozaki et al. teaches the claimed invention with the exception of varying the energy applied to the heat generating element to change the volume of the ink droplet.

Shirato et al. teaches that it is known in the ink jet art to vary the amount of energy applied to the heat generating element in order to vary the size of the ink droplet (col. 4:28-41). By recording with different drop sizes, an image having different print densities can be formed.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided Tachihara with means to change the volume of the ink drop by varying the energy applied to the heater, so that an image having different printing densities can be formed, as taught by Shirato et al.

10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ozaki et al. (5,660,739) in view of Shirato et al. (4,458,256), as applied to claims 1-5, 9 and 21/1 above, and further in view of Matsumoto (4,429,321).

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Ozaki et al., as modified, teaches the claimed invention with the exception of a driving circuit having a plurality of function devices for driving the heat generating elements provided with the substrate.

Matsumoto teaches an ink jet head comprising an epitaxial layer (119) which is a substrate. The substrate contains a plurality of function elements (11) which drive the heat generating elements (105). Integrating the function devices into the substrate provides the advantage of improving printing speed and recording element density col. 1:26-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided Ozaki et al., as modified, with function elements in the substrate which drive the heat generating elements for the purpose of improving printing speed and density, as taught by Matsumoto.

11. Claims 11-15 and 21/11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozaki et al. (5,660,739) in view of Shirato et al. (4,458,256) and Nakata et al. (EP-764,531) and .

Ozaki et al., as modified, teaches the claimed invention, as discussed above, with the exception of a moving member.

Nakata et al. teaches an ink jet print head comprising a moving member (31) for the purpose of directing the propagation of the pressure wave toward the ejection outlet, thereby increasing ejection efficiency, ejection force and ejection speed (see Summary).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided Ozaki et al, as modified, with a moving member

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for the purpose of directing the propagation of the pressure wave toward the ejection outlet, thereby increasing ejection efficiency, ejection force and ejection speed, as taught by Nakata et al.

12. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ozaki et al. (5,660,739) in view of Shirato et al. (4,458,256) and Nakata (EP-764531), as applied to claims 11-15 and 21/11 above, and further in view of Murthy et al. (5,658,471).

Ozaki et al., as modified, teaches the claimed invention with the exception of the heat generating element being composed of polycrystalline silicon.

Murthy et al. teaches that HfB_2 and polysilicon (polycrystalline silicon) are art recognized equivalents for making a heat generating element (col. 7:1-3). Because these two materials were art recognized equivalents at the time the invention was made for making a heating element for an ink jet print head, one of ordinary skill in the art would have found it obvious to substitute a polycrystalline silicon heat generating element for the HfB_2 heat generating element taught in Ozaki et al., for the purpose of ejecting a droplet of ink.

13. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ozaki et al. (5,660,739) in view of Shirato et al. (4,458,256) and Nakata (EP-764531), as applied to claims 11-15 and 21/11 above, and further in view of Matsumoto (4,429,321).

Ozaki et al., as modified, teaches the claimed invention with the exception of a driving circuit having a plurality of function devices for driving the heat generating elements provided with the substrate.

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Matsumoto teaches an ink jet head comprising an epitaxial layer (119) which is a substrate. The substrate contains a plurality of function elements 911) which drive the heat generating elements (105). Integrating the function devices into the substrate provides the advantage of improving printing speed and recording element density col. 1:26-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided Ozaki et al., as modified, with function elements in the substrate for driving the heat generating elements for the purpose of improving printing speed and density, as taught by Matsumoto.

Response to Arguments

14. Applicant's arguments with respect to claims 1-5, 9-15 and 19-23 have been considered but are moot in view of the new ground(s) of rejection.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael S. Brooke whose telephone number is 703-305-0262. The examiner can normally be reached on M-F 5:30-2:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on 308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-3431 for regular communications and 703-305-3431 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4900.



Michael S. Brooke
Examiner
Art Unit 2853

MSB
November 14, 2002